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SUBJECT MATTER INDEX OF APPLI- CATIONS FOR PATENTS.

July 21st to Aug. 20th inclusive.

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WEIGHING, &c.—W. Parnall, C. Renter, T. Ward.
 WINDOWS.—E. J. Hill, A. B. Carpenter, C. Martin.
 WHEELS for Carriages, &c.—F. Reynolds, J. Mansell.
 WIRE, Wire Working, &c.—W. R. Lake, W. H. Johnson.

* * * The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.

DOUGLASS'S NEW BURNER.

THIS invention has for its object improvements in oil and gas burners, having two or more open rings or ring chambers for oil and wicks when oil is used, and two or more perforated rings or ring chambers for gas when gas is used, the ring chambers being connected with deflectors constructed and employed as hereinafter described, and the combination producing in each case a burner of a greatly improved character, as compared with those hitherto used. What are termed deflectors have been before employed for the purpose of deflecting currents of air supplied to a burner, and in some cases the lip or edge of such deflector has been made to project slightly over the upward stream of ignited gases as they issue from a burner, but such burners have not consisted of several concentric chambers, and in no case has there been effected such a convergence of the ignited currents as is caused by the use of deflectors in the manner which the inventor has found to be necessary. The invention consists in an arrangement of an outer deflector surrounding the burner and lower part of the flames, one or more of which it covers, and in connection with this deflector is a deflecting glass chimney, both deflector and chimney being so formed as to force the outer flame or flames on to the inner flame or flames, and thus to condense the flames to the requisite extent, and deflect on to the internal and external surfaces of each of the flames the whole or nearly the whole of the ascending currents of air, and in such a manner as to invigorate the combustion of the flames and augment the intensity of their light. The invention also includes the means of employing two or more of the rings of flame with perfect combustion, or even one ring may be employed, and thus decreasing or increasing the intensity of the light without any alteration in the external form or dimensions.

This is a matter of great importance when the light is employed in combination with optical apparatus.

NOVEL MODE OF REPAIRING A CLYDE STEAMER.—The Allan steamer Manitoban, Captain MacNicol, master, that struck on Belle Isle Island, left St. Johns, N.F., on the 16th inst. for Glasgow, whither she was bound at the time of her collision with the rocks. Although the bolts of the Manitoban were literally torn out from the water line to the keel, yet in the course of a fortnight she was got ready for sea, and pronounced by competent surveyors to be in a thoroughly seaworthy condition. Condon, the ship-carpenter of St. Johns, by an ingenious contrivance was able to work inside the ship's hold, and constructed a solid wall of masonry between two solid and closely-fitting bulkheads. The space between the forward bulkheading and where the stem once had been was then filled in with cement and moulded to the exact lines of the steamer's bows. The disrupted and gaping iron plates that were sundered from the stem by the stroke of the collision were then forced back into their original positions by powerful screws, and held there by means of clamps and strong iron bands. The solid bow of concrete masonry was thus fortified, completely secured against any raid or concussion from the sea. The whole of the grain and cattle cargo was reshipped on the vessel.

Reviews.

SOCIOLOGY BASED UPON ETHNOGRAPHY.

"Sociology Based upon Ethnography." By Dr. CHARLES LETOUREAU. Translated by HENRY M. TROLLOPE. London: Chapman and Hall, Henrietta Street, Covent Garden.

THIS volume forms one of the Library of Contemporary Science, issued by Messrs. Chapman and Hall, and if a criterion of the subsequent volumes, a very interesting library it is likely to become.

As the space at our disposal does not admit of making quotations from this interesting work, we will content ourselves by advising all who take interest in the subject to study the work, which will be found both interesting and instructive.

ANNALS OF CHEMICAL MEDICINE.

"Annals of Chemical Medicine." Vol. 2. Edited by J. L. W. THUDICHUM, M.D. London: Longmans, Green, and Co.

THE advance made under the comprehensive word chemistry during the past few years renders it difficult to keep pace with the discoveries daily made, therefore any work on the subject, if same brings fresh discoveries forward, is welcomed by all scientific men.

The position occupied by Dr. Thudichum is sufficient to ensure the work under review being consulted by those most interested in the application of chemistry to physiology, pathology, therapeutics, pharmacy, toxicology, and hygiene, and to such we commend this work.

FLOATING MATTER OF THE AIR.

"Essays on the Floating-matter of the Air; in relation to Putrefaction and Infection." By JOHN TYNDALL, F.R.S. (M.D. Tubingen). London: Longmans, Green, and Co.

THIS interesting volume is a collection of essays. The first in the work is "On Dust and Disease," which provoked so much controversy some years ago.

In the preface, Professor Tyndall says:—The two principal ones, namely, Essays II. and III., were prepared for the Royal Society, and are published in the "Philosophical Transactions" for 1876 and 1877. But, though written for that learned body, I sought to render their style and logic so clear as to render them accessible to any fairly cultivated mind. The Essays IV. and V., on "Fermentation" and "Spontaneous Generation" have also already appeared; while the first essay, on "Dust and Disease," has been for some years before the public. It may be regarded as a kind of popular introduction to the more strenuous and original labours which follow it.

The essay most likely to try the reader's patience is No. III. On the whole, however, and particularly in its bearings on the germ theory of disease, it is probably the most important of all. The difficulties which sometimes beset the experimenter in these investigations are best illustrated by this essay. It shows, to my mind in a very impressive manner, the analogy of the spread of infection among organic infusions with its mode of propagation among human beings. The vital resistance of certain germs to heat is strikingly illustrated in the third essay, one infusion being there proved to maintain its potentiality of life intact after eight hours' continuous exposure to the temperature of boiling water. Under the plain guidance of the germ theory, it is however shown that an infusion of this stubborn character may be infallibly sterilised by discontinuous heating, in one hundredth part of the time requisite when the boiling is continuous. Another question, to my mind of fundamental importance, is also disposed of in Essay III., where it is shown that the

germs which exhibited the foregoing resistance are neither contained in the air, nor attached to the surface of the vessel, above the liquid, but that they manifest their extraordinary vitality in the body of the liquid itself.

On public sympathy the sanitary physician has mainly to rely for support, in a country where sanitary matters are left so much in the hands of the public itself as they are in England. But sympathy without cause—that is to say, without some basis of knowledge—is hardly to be expected. It is as a contribution to such knowledge that these essays have been collected, and thrown into their present handy form.

Referring to the second essay, "On Optical Department of the Atmosphere in relation to Putrefaction and Infection," various experiments and results and methods employed, are minutely described. The third essay describes further experiments.

It is impossible to give the whole ground over which the experiments made by Prof. Tyndall extend, each being distinctive and clear as to results produced; but as illustration we may quote the following experiments with soaked hay:—

Pondering still further on the influence of drying and hardening hay, and recognising the necessity of not only wetting but also softening the germs, the thought occurred to me of soaking the hay for so days prior to digesting it. Old London hay was accordingly chopped up and placed in three glass vessels—one containing distilled water, another acidulated water, and a third alkalised water. The superior extractive power of the alkalised liquid was at once manifest; it rapidly assumed a dark colour. The distilled water came next, yielding a colour less deep than that of the alkalised, but more deep than that of the acidulated water. The alkaline and distilled-water infusions emitted a rich odour of hay, while the smell of acid infusion was very faint, and not like that of hay. The hay was permitted to soak from the 8th to 11th of November. It was then digested for three hours in the same liquid at a temperature of 120° F., boiled, filtered, and introduced into the closed chambers, where it was reboiled in each case for five minutes.

Prior to digesting the hay in the liquid in which it had been soaked, *Bacteria* had developed in swarms. These, of course, were killed by the boiling, and they were not entirely removed by the filtration. The alkaline infusion, indeed, though filtered repeatedly, was sufficiently turbid to prevent the flame of a candle placed behind the tubes containing it from being seen. The same to a less extent was true of the distilled-water infusion. This latter had been divided into two portions, one of which was accurately neutralised, and the other left unneutralised, a separate chamber being devoted to each.

From the 11th the 18th of November the only change observed in any of the infusions was in the direction of increased transparency. They all became clearer with time, the distilled-water infusions becoming particularly clear and brilliant at the top. After two or three days' quiet the alkaline infusion allowed a flame placed behind it to be seen of a deep red. The acidulated-water infusion remained entirely unchanged; but this is not worth dwelling on, for in this case, even when exposed to the common air, the infusion resisted infection for a considerable time.

In no case was the fatty scum which had been already so frequently observed formed in any one of the tubes. Some change inimical to the particular organisms which produce this scum must have been caused by the soaking of the hay.

Examined microscopically on the 18th of November these infusions, I thought, exhibited undoubted evidences of Bacterial life. Bacterial forms were unquestionably there in considerable numbers, more parti-

cularly in the sediment at the bottoms of the tubes. Nor do I now see any valid grounds for doubting the presence of life; but I was warned against drawing too hastily the conclusion which first prompted itself, by boiling an infusion swarming with active *Bacteria*, and submitting the liquid after cooling to microscopic examination. Here also the dead Bacterial forms were preserved, and it was extremely difficult to distinguish their motions, which were certainly Brownian motions, from those observed in the protected infusions of soaked hay.

The work is well worth careful and attentive study.

SONNET.

TO E. W. W.

My friend, while moving in our world of art,
We live within the precinct of a sphere
Which hath no portion with earth's
children here;
Ours, is to lift the veil with reverent heart,
To mould life's mystic music, and impart
Her strains to each; and blend them, as
the seer
Peers thro' the truth which Nature's
symbols wear:
I with the pen, and thou the brush of Art.
Thus, thro' the world, we live and move as
one;
Our innate senses growing with the
breath
That ever pants in spirit unison
To leave this life a still diviner death:
E'en so with us! So may the dual soul,
In thy sweet wife, unite thy Angel whole.

HENRY GEORGE HELLON.

ON A MODIFICATION OF THE ELECTRIC LAMP.

By M. JAMIN.

THE lamp which the author has made known is of very small bulk and can be placed either in a vacuum or in inert gases within a globe entirely closed. Among the gases which have no action on the carbons rank nitrogen, carbonic oxide, marsh-gas, and probably carbon disulphide. The majority of the others are decomposed. Common air behaves in a peculiar manner. The vessel is first filled with ruddy vapours from the combination of oxygen and nitrogen under the electric influence. This compound is soon destroyed and the gas becomes colourless again. It is evident that the hyponitric acid is decomposed to supply oxygen to the carbon. Ultimately nothing remains but nitrogen and carbonic oxide.

During this time the electric arc undergoes corresponding changes. As long as there are red vapours, it varies at once in its intensity and its colour, rising and descending along the points. As the gas becomes decolourised the flame becomes fixed and changes its colour. When all the chemical transformations are completed, it is reduced to a well defined arc of a bluish-green, un-mixed with other colours. It becomes absolutely fixed without any fading in its intensity or variation in its colour or position. In no other case has the author remarked so complete a fixity which necessarily involves the same invariability in the lustre of the points. This circumstance will probably obviate the irregularities met with in all points.

This spectrum is traversed by an incredible quantity of very fine and almost regular lines. It presents a very unequal brightness in its different parts. There are seen four great maxima, which begin abruptly on the less refrangible side with a very brilliant line, which is repeated at equal distances, growing feebler. These maxima are in the yellow-green, the green, the blue, and the violet. They alone remain visible if the light is diminished. We recognise then the

spectrum of the blue flame of alcohol or of gas; that of the carburetted gases traversed by the spark of Ruhmkorff's coil, and lastly, that of the recent comet, as studied by M. Thollon: it is the electric spectrum of the vapour of carbon rendered incandescent without burning.

In the air the case is different; the carbon burns, the arc is red, and we see alternating at regular intervals the foregoing spectrum and another due to combustion and totally different; it presents a splendid assemblage of brilliant rays due to the combustion of the metals present in the carbon. It is evident that in an inert gas, we have a simple and purely electric phenomenon; that the arc is a current; that we can direct it and keep it invariably at the points by electro-magnetic action. Hence the remarkably fixity of the light. In the free air, on the contrary, the phenomenon is complex. There is still a current which we may fix, but there is also the combustion of the carbons over which we have no power, and which varies from moment to moment from the want of homogeneity in the carbons, occasioning those oscillations with which the electric light is justly charged.

If we operate in confined air, we observe at first the spectrum of combustion. As soon as the chemical transformations begin, the electric spectrum appears; the two are never seen at once, but succeed each other alternately; little by little the duration of the combustion spectrum decreases, whilst the electric spectrum is prolonged, and finally becomes persistent.

It is very remarkable that in the two cases the arc is characterised by spectra so dissimilar, and that the oscillations of the light are merely indications of the passage from one spectrum to the other.

It is still more important that as the carbons cease to burn they cease to wear out. When operating in the air with a medium current, there is expended 0.16 metre "candle" per hour, and as there are five candles of 0.32 metre per lamp, it lasts ten hours, or one night. In the closed apparatus, as the gas is transformed, the consumption decreases rapidly, and is reduced to 0.002 metre per hour. Each candle lasts 160 hours, each lamp 800 hours, or 80 nights of 10 hours each. We may say that the electric light is rendered perpetual; that it is enough to replace the carbons when the lamp requires cleaning; that their cost is almost abolished, and their quality rendered indifferent; that all daily attention is suppressed, and then the light acquires a steadiness hitherto unknown. It must be added that the lamp becomes ignited spontaneously as soon as the current is closed.

In practice, it is requisite to reduce as much as possible the dimensions of the glass globe containing the burner; carefully to prevent the outer air from entering when the apparatus is cold, whilst allowing the interior gas to escape by means of a valve, when the lamp is in action.—*Comptes Rendus*.

STEAM-BOILER NOTES.

THE following is so interesting and instructive that we cannot refrain from transferring it from the pages of the *Scientific American* to our own:

The reports of the chief engineers of the English boiler insurance companies of Manchester have been published, and contain much useful information for steam users. Mr. McDougall, of the Boiler Insurance and Steam Power Company, claims to have made 13,071 thorough internal examinations and hydraulic tests, and to have had not one explosion and but one serious collapse among the 20,000 boilers in his care. The passage of the Employers' Liability Act, he thinks, will greatly extend the operations of boiler insurance companies, and should tend to effect a great improvement. Mr. Lavington E. Fletcher, chief engineer of the Manches-

ter Steam Users' Association, in his monthly report, states that 971 boilers were examined from May 28 to June 24, of which 467 were thorough annual inspections.

The discussion of the subject of flat cast-iron boiler-heads is still going on in Philadelphia, and the interest seems to increase. The *Iron Age*, possibly speaking by authority, repeats the assertion that "the Hartford Company have instructed their agents in Philadelphia not to approve boilers with flat cast-iron heads with a greater diameter than 36 inches;" but says "the Company do not wish this action to be construed as indicating a desire not to accommodate manufacturers; but in view of the recent verdict of the coroner's jury, in the case of the explosion at the dye-works of Gaffney and Dolan, they do not care to continue writing on this class of boilers."

Since the experimental bursting of a duplicate of the Gaffney boiler-head by the makers, Sidebotham and Powell, on the 13th of July, as suggested in our "Notes" of July 2, to the jury, and illustrated in the *Scientific American* of July 30, the inspectors of Philadelphia seem to have plucked up courage, especially the city inspector, Mr. Overn, who has been prompted by a lawyer, the city solicitor, to stand on his dignity as a mechanical expert, and he accordingly appears, by the *Ledger*, to say that he regarded the test as a satisfactory test as to the strength of cast-iron in the ends of the boiler. The cast-iron held good up to 450 pounds, and under this showing he (Overn) would have no hesitation in giving a boiler, with the same quality of cast-iron, a pressure of 80 pounds to the square inch.

It is due to this gentleman to say that this is perfectly in accordance with his faith before the Gaffney explosion, but a misinterpretation of the cause of that accident by some experts shook his faith in his own judgment.

Some instances of apparent hardship to owners of steam-boilers since the flat-head controversy began are given in the *Philadelphia Record* of the 16th of July. The lumber mills of Van Horn and Son, at Whitehall, have been closed since the 11th inst., and are likely to remain so, waiting a city inspector's certificate. The machinery of this firm had been running night and day to fill orders, and the loss, besides the cost of new boilers, is represented as being heavy: cause, 36-inch flat cast-iron heads in their 42-foot boilers. Borie and Mackay, Frankford, have received similar treatment from one set of inspectors, while the other passed them so they could continue work. A large number of other boilers have lately been refused certificates, and when this is done by the city inspector they must stop. Messrs. Garsed and Co., large manufacturers of cotton-yarns in Frankford, were compelled to throw out four boilers 80 feet long, while 40 feet of the furnace end of them that were removed fourteen years ago are said to be running now under inspection. It may be urged by the inspectors that these 80-foot boilers are dangerously long, but they have an exceptionally good arrangement of supports, which has served for over thirty years to prevent undue strains from sagging. They rest at the ends upon solid supports. Two sets of four volute steel car-springs are placed upon heavy arched girders, at SS, that span the boiler-settings at such intervals as to make even and elastic supports, thereby preventing undue strains on the lower side of the boiler from slender proportions.

These four boilers were built by Brooks and Stanhope, in 1850, John Powell (now of Sidebotham and Powell), foreman; and for many years after they were put to work the engineer used leaden gaskets for the man-hole joints, and he had a habit of adjusting his plate and gasket when closing the boilers and screwing up pretty hard. But if the joint was not tight after raising steam, he was accustomed to beat the head with a

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heavy sledge near the gasket seat, to settle the uneven plate upon the lead and make it steam-tight. The marks of this violence are still plainly seen on the castings, which are about the same thickness and style as the Gaffney boiler-heads.

The *Ledger* also credits Mr. Overn with the remark "that he was inclined to believe, from what he had recently observed, that eventually the city would have the entire work of inspection, for he thought the Hartford people would drop the inspection department of their business and confine themselves solely to insurance, relying on the city's inspection."

It naturally occurs to lookers on who feel an interest in the subject to inquire why the verdict of an unfriendly jury should make a breach between an insurance company who have heretofore been not only willing but desirous of insuring, and the friendly manufacturers who were willing and desirous of having them insure boilers that have during their experience proved as safe as any of that type. The *Philadelphia Record*, in commenting on the flat-head muddle and its effect on the manufacturing interests since the Gaffney explosion, says, "Nearly two-thirds of the boilers in use in the suburbs have flat cast-iron heads, and the owners are in daily fear that an edict will be promulgated which will put a temporary stop to their operations."

We learn that a boiler explosion took place about the 19th of July, 1881, at Watertown, near Marietta, Ohio. The boiler of a saw-mill was blown to atoms. Hiram Brockway and Eugene Barclay were instantly killed. Three others, Isaac Johnson, Robert Alexander, and William Conner, were fatally injured. Johnson has since died.

The June number of the Hartford Steam-Boiler Insurance Company's Circular contains the inspector's report for April, 1881, by which it appears that 3960 boilers were viewed, of which 1593 were inspected internally and externally, and 528 dangerous defects were found; notable among them were 23 safety-valves in dangerous condition and 74 boilers without steam-gauges. Thirty-nine boilers were condemned in April. There is also notice of eight explosions in May, and one illustrated explosion that occurred in 1877, in Brooklyn, N.Y.

THE PRESIDENTIAL COLD-AIR MACHINE.

THE apparatus which proved most satisfactory in cooling the chamber of the wounded President was furnished by a Mr. Jennings, of Baltimore. It was devised for use in a new process of refining lard. According to the inventor's description the apparatus consists of a cast-iron chamber, about 10 feet long and 3 wide and 3 high, filled with vertical iron frames covered with cotton terry or Turkish toweling. These screens are placed half an inch apart, and represent some 3000 feet of cooling surface. Immediately over these vertical screens is placed a coil of inch iron pipe, the lower side of which is filled with fine perforations. Into a galvanised iron tank, holding 100 gallons of water, is put finely granulated or shaved ice (and salt when a low temperature is required). This water is sprayed upon the sheets in the lower tank constantly. In each end of the iron chamber are openings 13 inches square. To the outer end of this chamber is a pipe connecting with an outdoor air-conductor. To the opposite end is connected a similar pipe leading into an ice-chamber at its top, and from the bottom of the same a pipe leads to a small exhaust-fan, and from the fan the now cold and dry air is forced direct into the President's room through a flue some 20 feet in length. Air at 99 degrees temperature to-day is supplied at the rate of 22,000 cubic feet per hour at the register in the President's room at

54 degrees, and with the windows and doors open the temperature at the President's bed (25 feet away) is maintained steadily at 75 degrees day and night. When the cold air machine was introduced it was intended to keep the windows and doors closed, and under these conditions the machine would create and maintain a temperature of 60 degrees in [the hottest weather without using the auxiliary ice-air chamber now used, which was the suggestion of Prof. Newcomb and Major Powell, to meet the requirements of cooling the room with the doors and windows open. The closing of them gave the room an air of gloom. An extra ice-chamber fan and engine has been put up in a room opening into the hall near the first apparatus, to be used in case of accident and to cool the corridors of rooms adjoining the President's.—*Scientific American*.

PAVING BY ELECTRIC LIGHT.

WE observe that the Comptroller of the Bridge House Estate has issued a public notice to the effect that on and after Monday, September 5, the carriage way of London Bridge will be partially closed for the purpose of being repaired, and that during the execution of the work provision will be made for keeping open two lines of traffic, namely, one from the City and the other into Southwark. Nothing, however, is said about the expected duration of the repairs or the utilisation of the electric light to facilitate the work by enabling it to be carried on during night time. All sorts of building, harvesting, and manufacturing operations, even of a delicate kind, are now regularly carried on after dark by aid of a new illuminant, yet the rude work of paving streets and thoroughfares has not been prosecuted by its means, even in busy London and congested London Bridge. The City authorities now have the electric light along the bridge itself, and there is no occasion to resort to a portable electric lighting apparatus, to carry on the paving operations. The mere fact that the original contract with the Messrs Siemens only stipulates for the light during several hours of the fore-night, need not prevent the light being supplied the whole night through, since Messrs Siemens would doubtless be ready to keep their lamps going all the time. By doubling the effective working shift in this way the repairs of the bridge could be concluded in half the time which they take by the present system of working only during the hours of daylight and lying by all night. With the electric light at command, and actually *in situ*, there can be no good reason for abiding by the old method.

MAKING PARABOLIC MIRRORS.

A VERY ingenious method of manufacturing parabolic reflecting surfaces has been invented by M. Latchinoff, who has described the process fully in our Russian contemporary *L'Electricité*. It is based on the fact that all points of the free surface of a liquid turning round a vertical axis acquire a constant angular velocity and take a parabolic form. If then the liquid is put into a vessel which is rotated round a vertical axis it forms a hollow shell of parabolic section inside, and if the liquid is one which will solidify a rigid paraboloid will be obtained capable of being used as a reflector. M. Latchinoff therefore mounts a hemispherical vessel upon a vertical shaft carrying a pulley, and rotates it by an endless belt from a motor. Into this he pours a sufficient quantity of plaster-of-paris liquid or a solution of the mastic prepared by M. Mendelejeff. Fusible metals would serve the purpose too, but they are apt to oxidise on the surface, and in cooling they tend to crystallise. The shape of the vessel need not necessarily be a hemisphere, but this form is convenient; and a glass

cover should be added to it. To regulate the thickness of the liquid shell a ring of wood is fixed within the bowl at a proper distance below the edge. This prevents the liquid rising above a certain height. Regularity of motion is most essential to the success of the operation, and hence a steam engine is not adapted to drive it; but a small Gramme or Siemens dynamo-electric machine actuated by a Thomsen or a Telikoleff battery will answer well. Three or four cells will suffice, and the speed can be regulated by resistance placed in circuit. With a Deprez or Helmholtz regulator any kind of battery may be used. An angular speed of a turn per second is quite sufficient for the purpose; and the axis ought to be verticalised by means of a spirit level, and fixed so as to be free from shake or jar. The liquid should be one which solidifies slowly, say in an hour, and without shrinking much in bulk. The shells thus prepared can be made reflective by electrotyping with nickel silver, or iron, which when prepared in this way, oxidises with difficulty, and being almost white, will serve for a reflector if kept under glass.

THE GREAT WESTERN RAILWAY.—An additional line, constructed by the Great Western Railway in order to accommodate their increasing suburban traffic, has been opened between Uxbridge and West Drayton, under the supervision of Mr. A. Higgins, divisional superintendent of the London district, and Mr. C. E. Spagnoletti, chief of the company's telegraphic department. At the same time a novel and most valuable electrical signalling apparatus, invented by Mr. Spagnoletti for the purpose of securing the safety of travellers, and which is destined to supersede the ordinary block system now in vogue, was brought into successful operation between the West Drayton Junction and Uxbridge Station. The object of the apparatus, which has received the approval of the directors, is the interlocking of the outdoor semaphore signals with the block telegraph system by electrical and mechanical means, the trains themselves taking part in the working. Its mode of application was thus exemplified. Uxbridge having a train ready to leave the station, signalled a couple of "beats" to the West Drayton box, when the officer then in charge replied with four beats, pressed the "plunger" and took off the lock at Uxbridge signals, and thus permitted the up train to leave the terminus, the line being clear between the latter place and West Drayton. As the train neared the signal box at West Drayton a slight deflection of the rails at a certain point communicating by a mechanical arrangement with an indicator in the cabin published the fact that the line was "clear," though no second train could still be despatched from Uxbridge till the lock was again taken off its signals by the man in the West Drayton box. In the same way no train could leave West Drayton Junction till the lock had been electrically removed from its signal lever by the signalman at Uxbridge, the apparatus, in every instance after the departure of a train, becoming re-locked, thus preventing any possibility of a second train following and coming into collision with the first, as before another would be allowed to quit the station the lock would have again to be taken off the lever by the signalman at the end of the section, who, if a train had broken down or met with an accident, would not release it, having had no intimation that the line was "clear," in consequence of the non-arrival of the train at the indicating point beneath the metals in the vicinity of his cabin. So perfect is the apparatus beneath the deflecting rail that the number of the carriages comprising the trains could be counted by the vibration of the wheels heard distinctly in the signal box as the vehicles passed along the line to West Drayton Station.

The Scientific Review

AND

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SESSION 1880—1881.

The Institute being out of Session, further meetings will not be held till next Session, commencing in November.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Monthly Notices.

Electric Navigation.—Rear-Admiral Bourgeois has been appointed by the French Government President of the committee to examine and report on the various applications of electricity to navigation.

Rock Blasting.—Major Lauer, of the Austrian Engineers, has made some experiments at Krems, on the Danube, on blasting rocks under water, which have attracted considerable attention. Into a cylinder he puts a quantity of dynamite, which is connected with an electrical apparatus. The cylinder is placed on the surface of the water only, and fixed in that position. No matter how deep the water may be over the rock, it is shattered, when the dynamite explodes, into fragments so small that they are washed away by the stream. This process is said to save forty per cent. on the cost of removing submerged rocks. Ten thousand florins were subscribed to enable Major Lauer to make further trials on a gigantic scale.—*Athenæum*.

The Victoria Mining Surveyors and Registrars for the quarter ended 31st March, 1881, inform us that the total quantity of gold obtained in that period was 193,345 oz.

It is announced in the *Athenæum* that Miss Pogsen, who for some years has discharged with great ability the duties of Assistant-Astronomer to the Government of Madras, has been appointed Meteorological Reporter to that Government.

Mr. Valentine Ball, M.A., of the Geological Survey of India, has been nominated by the Council of the University of Dublin to the professorship of geology in that university. This nomination requires to be confirmed by the Board of Trinity College. Prof. Ball has just published a small volume on "The Diamonds, Coal, and Gold of India," of which we shall shortly give a notice.

Prof. Oliver J. Lodge, who has been for some time Assistant-Professor of Physics at University College of London, has been appointed to the Lyon Jones Professorship of Experimental Physics and Mathematics in University College, Liverpool.

Mr. Parfitt, of Exeter, who, through the Devonshire Association for the Advancement of Science, has published eighteen parts of the entire Fauna of this beautiful county, hopes this year, at the annual meeting of the Association, to be held at Dawlish on the 26th and two following days, to read the introduction to the nineteenth part—viz., Ichneumonidæ. The section contains several species new to the British list. His Fauna of Devon is more numerous than the Yorkshire Fauna of Messrs. Clarke and Roebuck which we mentioned last week.—*Athenæum*.

Les Mondes directs attention to a new source of selenium. At Cachenta, in the province of Mendoza, in the Argentine Republic, there is found an ore containing 28 per cent. of selenium. It is said to be associated with silver, copper, lead, iron, tellurium, and sulphur.

Persia, it is said, is making considerable progress in the direction of education. Hitherto education in that country has been mostly confined to religious learning; now, however, the nucleus of a university is being formed at Ispahan, colleges being in the course of erection there for the teaching of languages, European as well as Asiatic, and the arts and sciences, mostly under European supervision.

European Papyrus.—The translation by M. Golenischeff of a most interesting Egyptian hieratic papyrus, relating romantic adventures in Punt or Somali, probably in the thirteenth dynasty, will appear shortly. They are as curious as those known as the "Adventures of Sancha and the Predestined Prince."

The Moniteur des Intérêts Matériels (Brussels) states that considerable attention has lately been directed to the new system of dephosphorisation brought out by M. Antoine Rollet, of Creusot. M. Rollet employs two alternative processes. In the one a cupola with basic lining is used; the phosphoric iron is mixed with lime, fluor spar, dolomite, &c., and the mixture is brought to an intense heat in order to obtain a liquid basic slag. By the other method the dephosphorisation is carried on in a Bessemer converter, or a fire furnace; the phosphoric slag which is formed during the first part of the process is removed, and the other impurities are then taken away by one or other of the ordinary methods.

THE SCIENTIFIC REVIEW

AND

Scientific and Literary Review

INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

SEPTEMBER, 1881.

BRITISH ASSOCIATION, 1881.

THE new President of the Association, Sir J. LUBBOCK, Bart., was introduced to a crowded assembly at York, on the 31st August, when he delivered the following address, in which he stated that:—

Fifty years ago it was the general opinion that animals and plants came into existence just as we now see them. We took pleasure in their beauty; their adaptation to their habits and mode of life in many cases could not be overlooked or misunderstood. Nevertheless, the book of Nature was like some richly illuminated missal, written in an unknown tongue; the graceful forms of the letters, the beauty of the colouring, excited our wonder and admiration; but of the true meaning little was known to us; indeed, we scarcely realised that there was any meaning to decipher. Now glimpses of the truth are gradually revealing themselves; we perceive that there is a reason—and in many cases we know what that reason is—for every difference in form, in size, and in colour; for every bone and every feather, almost for every hair. Moreover, each problem which is solved opens out vistas, as it were, of others perhaps even more interesting. With this great change the name of our illustrious countryman, Darwin, is intimately associated, and the year 1859 will always be memorable in science as having produced his great work on "The Origin of Species." In the previous year he and Wallace had published short papers, in which they clearly state the theory of natural selection, at which they had simultaneously and independently arrived. We cannot wonder that Darwin's views should have at first excited great opposition. Nevertheless from the first they met with powerful support, especially in this country, from Hooker, Huxley, and Herbert Spencer. The theory is based on four axioms: 1. That no two animals or plants in nature are identical in all respects. 2. That the offspring tend to inherit the peculiarities of their parents. 3. That of those which come into existence only a small number reach maturity. 4. That those which are on the whole best adapted to the circumstances in which they are placed are most likely to leave descendants. Darwin commenced his work by discussing the causes and extent of variability in animals, and the origin of domestic varieties; he showed the impossibility of distinguishing between varieties and species, and pointed out the wide differences which man has produced in some cases—as, for instance, in our domestic pigeons, all unquestionably descended from a common stock. He dwelt on the struggle for existence (which has since become a household word), and which inevitably resulting in the survival of the fittest, tends gradually to adapt any race of animals to the conditions in which it occurs. Mr. Darwin's views, however, were still misunderstood. I believe there are thousands who consider that, according to this theory, a sheep might turn into a cow, or a zebra into a horse. No one would more confidently withstand any such hypothesis, his view being, of course, not that the one could be changed into the other, but that both are

descended from a common ancestor. No one will question the immense impulse which Darwin has given to the study of natural history. When we were young we knew that the leopard had spots, the tiger was striped, and the lion tawny, but why this was so it did not occur to us to ask; and if we had asked no one would have answered. Now we see at a glance that the stripes of the tiger have reference to its life among jungle grasses; the lion is sandy like the desert; while the markings of the leopard resemble spots of sunshine glancing through the leaves. Huxley has shown that the profound break once supposed to exist between birds and reptiles has been bridged over by the discovery of reptilian birds and bird-like reptiles, so that, in fact, birds are modified reptiles.

Sir JOHN next adverted to the remarkable confirmation which embryology contributes to the theory of descent, and explained how extremely minute inquiries may have important practical bearings. The researches of the late Professor Rolleston went to show that the fluke which produces the rot in sheep passes one phase of its existence in the black slug, and this knowledge leads to the hope that this pest of the farmers may be diminished if not extirpated.

Nothing could have appeared less likely than that researches into the theory of spontaneous generation should have led to practical improvements in medical science. Yet such has been the case. Only a few years ago bacteria seemed mere scientific curiosities. It had long been known that an infusion—say of hay—would, if exposed to the atmosphere, be found, after a certain time, to teem with living forms. One reason why compound fractures are so dangerous is because, the skin being broken, the air obtains access to the wound, bringing with it innumerable germs, which too often set up putrefying action. Lister first made a practical application of these observations. He set himself to find some substance capable of killing the germs without being itself too potent a caustic, and he found that diluted carbolic acid fulfilled these conditions. This discovery has enabled many operations to be performed which would previously have been almost hopeless. There is great reason to suppose that many diseases, especially those of a zymotic character, have their origin in the germs of special organisms. The parasitic organisms are at first few, but gradually multiply at the expense of the patient, and then die out again. Indeed, it seems to be thoroughly established that many diseases are due to the excessive multiplication of microscopic organisms, and we are not without hope that means will be discovered by which, without injury to the patient, these terrible, though minute, enemies may be destroyed and the disease thus stayed.

With regard to the antiquity of man, the President reviewed the evidences of the race having passed through the stone, bronze, and iron age. The great glacial epoch must be fixed 300,000 years ago, and it was well established that man inhabited these islands in the milder periods of that epoch:

When geology so greatly extended our ideas of past time the continued heat of the sun became a question of greater interest than ever. Helmholtz has shown that while adopting the nebular hypothesis we need not assume that the nebulous matter was originally incandescent, but that its present high temperature may be, and probably is, mainly due to gravitation between its parts. It follows that the potential energy of the sun is far from exhausted, and that with continued shrinking it will continue to give out light and heat with little, if any, diminution for several millions of years. Like the sand of the sea, the stars of heaven have ever been used as effective symbols of number, and the improvements in our methods of observation have added fresh force to our original impressions. We now know that our earth is but [a fraction of one out of at least

75,000,000 worlds. But this is not all. In addition to the luminous heavenly bodies, we cannot doubt that there are countless others, invisible to us from their greater distance, smaller size, or feebler light; indeed we know that there are many dark bodies which now emit no light or comparatively little. Thus in the case of Procyon, the existence of an invisible body is proved by the movement of the visible star. Again I may refer to the curious phenomena presented by Algol, a bright star in the head of Medusa. This star shines without change for two days and thirteen hours; then, in three hours and a half, dwindles from a star of the second to one of the fourth magnitude; and then, in another three and a-half hours, reassumes its original brilliancy. These changes seem certainly to indicate the presence of an opaque body, which intercepts at regular intervals a part of the light emitted by Algol. Thus the floor of heaven is not only "thick inlaid with patines of bright gold," but studded also with extinct stars, once probably as brilliant as our own sun, but now dead and cold, as Helmholtz tells us that our sun itself will be some seventeen millions of years hence.

Referring to the undulating theory of light and the subject of colours and the ultimate constitution of matter, the president remarked:

The idea is now gaining ground, that, as maintained by Clerk-Maxwell, light itself is as electro-magnetic disturbance, the luminiferous ether being the vehicle of both light and electricity. Wünsch, as long ago as 1792, had clearly shown that the three primary colours were red, green, and violet; but his results attracted little notice, and the general view used to be that there were seven principal colours—red, orange, yellow, green, blue, indigo, and violet; four of which—namely, orange, green, indigo, and violet—were considered to arise from mixtures of the other three. Red, yellow, and blue were therefore called the primary colours, and it was supposed, that in order to produce white light, these three colours must always be present. Helmholtz, however, again showed, in 1852, that a colour to our unaided eyes identical with white, was produced by combining yellow with indigo. At that time yellow was considered to be a simple colour, and this, therefore, was regarded as an exception to the general rule, that a combination of three simple colours is required to produce white. Again, it was, and indeed still is, the general impression that a combination of blue and yellow makes green. This, however, is entirely a mistake. Of course we all know that yellow paint and blue paint make green paint; but this results from absorption of light by the semi-transparent solid particles of the pigments, and is not a mere mixture of the colours proceeding unaltered from the yellow and the blue particles; moreover, as can easily be shown by two sheets of coloured paper and a piece of window glass, blue and yellow light, when combined, do not give a trace of green, but if pure would produce the effect of white. Green, therefore, is after all not produced by a mixture of blue and yellow. On the other hand, Clerk-Maxwell proved in 1860 that yellow could be produced by a mixture of red and green, which put an end to the pretension of yellow to be considered a primary element of colour. From these and other considerations it would seem, therefore, that the three primary colours—if such an expression be retained—are red, green, and violet. The existence of rays beyond the violet, though almost invisible to our eye, had long been demonstrated by their chemical action. Stokes, however, showed in 1852 that their existence might be proved in another manner, for that there are certain substances which, when excited by them emit light visible to our eyes. To this phenomenon he gave the name of fluorescence. At the other end of the spec-

trum Abney has recently succeeded in photographing a large number of lines in the infra-red portion, the existence of which was first proved by Sir William Herschel. From the rarity, and in many cases the entire absence, of a reference to blue, in ancient literature, Geiger—adopting and extending a suggestion first thrown out by Mr. Gladstone—has maintained that, even as recently as the time of Homer, our ancestors were blue-blind. Though for my part I am unable to adopt this view it is certainly very remarkable that neither the Rigveda, which consists almost entirely of hymns to Heaven, nor the Zendavesta, the Bible of the Parsees or fire-worshippers, nor the old Testament, nor the Homeric poems, ever allude to the sky as blue. On the other hand, from the dawn of poetry, the splendour of the morning and evening skies have excited the admiration of mankind. As Ruskin says, in language almost as brilliant as the sky itself, the whole heaven "from the zenith to the horizon, becomes one molten, mantling sea of colour and fire; every black bar turns into massy gold, every ripple and wave into unsullied, shadowless crimson, and purple, and scarlet, and colours for which there are no words in language, and no ideas in the mind—things which can only be conceived while they are visible; the intense hollow blue of the upper sky melting through it all, showing here deep and pure, and lightness; there, modulated by the filmy formless body of the transparent vapour, till it is lost imperceptibly in its crimson and gold." But what is the explanation of these gorgeous colours? Why is the sky blue? and why are the sunrise and sunset crimson and gold? It may be said that the air is blue, but if so how can the clouds assume their varied tints? Brücke showed that very minute particles suspended in water are blue by reflected light. Tyndall has taught us that the blue of the sky is due to the reflection of the blue rays by the minute particles floating in the atmosphere. Now, if from the white light of the sun the blue rays are thus selected, those which are transmitted will be yellow, orange, and red. Where the distance is short the transmitted light will appear yellowish. But as the sun sinks towards the horizon the atmospheric distance increases, and consequently the number of the scattering particles. They weaken in succession the violet, the indigo, the blue, and even disturb the proportions of green. The transmitted light under such circumstances must pass from yellow through orange to red, and thus, while we at noon are admiring the deep blue of the sky, the same rays, robbed of their blue, are elsewhere lighting up the evening sky with all the glories of sunset. Another remarkable triumph of the last half-century has been the discovery of photography. At the commencement of the century Wedgwood and Davy observed the effect produced by throwing the images of objects on paper or leather prepared with nitrate of silver, but no means were known by which such images could be fixed. This was first effected by Niepce, but his processes were open to objections, which prevented them from coming into general use, and it was not till 1839 that Daguerre invented the process which was justly named after him. Very soon a further improvement was effected by our countryman Talbot. He not only fixed his "Talbotypes" on paper—in itself a great convenience—but, by obtaining a negative, rendered it possible to take off any number of positive, or natural, copies from one original picture.

Passing on to the subject of Electricity, Sir John Lubbock continued:—Electricity in the year 1881 may be considered to have just been ripe for its adaptation to practical purposes; it was but a few years previously, in 1819, that Oersted had discovered the deflection action of the current on the magnetic needle, that Ampère had laid the foundation

of electro-dynamics, that Schweitzer had devised the electric coil or multiplier, and that Sturgeon had constructed the first electro-magnet. It was in 1831 that Faraday, the prince of pure experimentalists, announced his discoveries of voltaic induction and magneto-electricity, which with the other three discoveries constitute the principles of nearly all the telegraph instruments now in use; and in 1834 our knowledge of the nature of the electric current had been much advanced by the interesting experiment of Sir Charles Wheatstone, proving the velocity of the current in a metallic conductor to approach that of the wave of light. Practical applications of these discoveries were not long in coming to the fore, and the first telegraph line on the Great Western railway from Paddington to West Drayton was set up in 1838. In America Morse is said to have commenced to develop his recording instrument between the years 1832 and 1837. In 1851, submarine telegraphy became an accomplished fact through the successful establishment of telegraphic communication between Dover and Calais. Submarine lines followed in rapid succession, crossing the English Channel and the German Ocean, threading their way through the Mediterranean, Black, and Red Seas, until in 1866, after two abortive attempts, telegraphic communication was successfully established between the Old and the New Worlds, beneath the Atlantic Ocean. Duplex and quadruplex telegraphy, one of the most striking achievements of modern telegraphy, the result of the labours of several inventors, should not be passed over in silence. It not only serves for the simultaneous communication of telegraphic intelligence in both directions, but renders it possible for four instruments to be worked irrespectively of one another, through one and the same wire connecting two distant places. Another more recent and perhaps still more wonderful achievement in modern telegraphy is the invention of the telephone and microphone, by means of which the human voice is transmitted through the electric conductor, by mechanism that imposes through its extreme simplicity. In this connection the names of Reiss, Graham Bell, Edison, and Hughes are those chiefly deserving to be recorded. By the electric transmission of power, we may hope some day to utilise at a distance such natural sources of energy as the Falls of Niagara, and to work our cranes, lifts, and machinery of every description by means of sources of power arranged at convenient centres. To these applications the Brothers Siemens have more recently added the propulsion of trains by currents passing through the rails, the fusion in considerable quantities of highly refractory substances, and the use of electric centres of light in horticulture as proposed by Werner and William Siemens. By an essential improvement by Faure of the Planté Secondary Battery, the problem of storing electrical energy appears to have received a practical solution, the real importance of which is clearly proved by Sir W. Thomson's recent investigation of the subject. It would be difficult to assign the limits to which this development of electrical energy may not be rendered serviceable for the purposes of man. In mechanical science the progress has not been less remarkable than in other branches. The introduction of iron has, moreover, had a vast influence on the works of both the civil and military engineer. Before 1830, Telford had constructed an iron suspension turnpike road bridge of 560 feet over the Menai Straits; but this bridge was not adapted to the heavy weights of locomotive engines. At the same time, with steel at his command, Mr. Fowler is engaged in carrying out the design for a railway bridge over the Forth, of two spans of 1,700 feet each; that is to say, of nearly one-third of a mile in length. As regards railways, the Stockton and Darlington Railway was opened in

1825, but the Liverpool and Manchester Railway, perhaps the first truly passenger line, dates from 1830, while the present mileage of railways is over 200,000 miles, costing nearly £4,000,000,000 sterling. It was not until 1838 that the Sirius and Great Western first steamed across the Atlantic. The steamer, in fact, is an excellent epitome of the progress of the half-century; the paddle has been superseded by the screw; the compound has replaced the simple engine; wood has given place to iron, and iron in its turn to steel. The saving in dead weight, by this improvement alone, is from 10 to 16 per cent. The speed has been increased from nine knots to fifteen, or even more. Lastly, the steam-pressure has been increased from less than 5lb. to 70lb. per square inch, while the consumption of coal has been brought down from 5lb. to 6lb. per horse-power to less than two. It is a remarkable fact that not only is our British shipping rapidly on the increase, but it is increasing relatively to that of the rest of the world. In 1860 our tonnage was 5,700,000 against 7,200,000; while it may now be placed as 8,500,000 against 8,200,000; so that considerably more than half the whole shipping of the world belongs to this country.

Summing up the principal results which have been attained in the last half-century, we may mention (over and above the accumulation of facts) the theory of evolution, the antiquity of man, and the far greater antiquity of the world itself; the correlation of physical forces and the observation of energy; spectrum analysis and its application to celestial physics; the higher algebra and the modern geometry; lastly, the innumerable applications of science to practical life—as, for instance, in photography, the locomotive engine, the electric telegraph, the spectroscope, and most recently the electric light and the telephone. To science, again, we owe the idea of progress. The ancients, says Bagehot, “had no conception of progress; they did not even entertain it.” It is not, I think, now going too far to say that the true test of the civilisation of a nation must be measured by its progress in science. It is often said, however, that great and unexpected as the recent discoveries have been, there are certain ultimate problems which must ever remain unsolved. For my part I would prefer to abstain from laying down any such limitations. When Park asked the Arabs what became of the sun at night, and whether the sun was always the same, or new each day, they replied that such a question was childish, and entirely beyond the reach of human investigation. I have already mentioned that, even as lately as 1842, so high an authority as Comte treated as obviously impossible and hopeless any attempt to determine the chemical composition of the heavenly bodies. Doubtless there are questions, the solution of which we do not as yet see our way even to attempt; nevertheless the experience of the past warns us not to limit the possibilities of the future. But however this may be, though the progress made has been so rapid, and though no similar period in the world's history has been nearly so prolific of great results, yet, on the other hand, the prospects of the future were never more encouraging. We must not, indeed, shut our eyes to the possibility of failure; the temptation to military ambition; the tendency to over-interference by the State; the spirit of Anarchy and socialism; these and other elements of danger may mar the fair prospects of the future. That they will succeed, however, in doing so, I cannot believe. I cannot but feel confident hope that fifty years hence, when perhaps the city of York may renew its hospitable invitation, my successor in this chair—more competent, I trust, than I have been to do justice to so grand a theme—will have to record a series of discoveries even more unexpected and more brilliant than

those which I have, I fear, so imperfectly attempted to bring before you this evening, for one great lesson which science teaches us is, how little we yet know, and how much we have still to learn.

The address was well received throughout, and the president on resuming his seat was loudly cheered. The Lord Mayor of York then gave the association a hearty welcome to the city in the name of the citizens. Amongst those present were Professors Owen, Huxley, Roscoe, Marsh, Whitney, Carey, Forster, Dewar, Flower, Sir J. Hooker, Sir W. Thomson, Mr. Spottiswoode, Dean of York, Drs. Frankland, Williamson, Russell, Odling, Mr. Grant Duff, Sir J. Hay, &c. The number of tickets issued was 2,264, and it was fully expected that the number will be considerably augmented by to-morrow. The financial statement shows a balance of £88, with an invested capital of £8,500. The invitations for next year are from Leicester, Southport, Oxford, Birmingham, Aberdeen, and Nottingham, and Worcester asks the association to visit that city in 1884.

As this year is the centenary of the birth of Sir David Brewster (President of the Inventors' Institute up to the time of his death), it ought to be prominently mentioned that the first impulse which led to the convening of the inaugural meeting half a century ago, was given by him in a letter dated February 23, 1831, and addressed to Mr. John Phillips, who was then the secretary of the York Philosophical Society and curator of its museum. The letter in question is such an interesting memorial that we reproduce it *in extenso*.

“Allerby by Melrose, Feb. 23rd, 1831.

“Dear Sir,—I have taken the liberty of writing to you on a subject of considerable importance. It is proposed to establish a ‘British Association of Men of Science’ similar to that which has existed for eight years in Germany, and which is now patronised by the most powerful sovereigns in that part of Europe. The arrangements for the first meeting are in progress, and it is contemplated that it shall be held in York as the most central city of the three kingdoms. My object in writing to you at present is to beg that you would ascertain if York will furnish the accommodation necessary for so large a meeting, which might, perhaps, consist of 100 individuals—if the Philosophical Society would enter zealously into the plan, and if the mayor and influential persons in the town, and in the vicinity, would be likely to promote its objects. The principal objects of the Society would be to make the cultivators of science acquainted with each other—to stimulate each other to new exertions—to bring the objects of science before the public eye—and to take measures for advancing its interests, and accelerating its progress. The Society would possess no funds, make no collections, and hold no property, the expense of each Anniversary Meeting being defrayed by the members who are present.

“As these few observations will enable you to form a general opinion of the object in view, I shall only add, that the time of meeting which is likely to be most convenient would be about the 18th or 25th of July.

“I am, dear sir,

“Evermost truly yours,

“D. BREWSTER.

“J. Phillips, Esq.”

CAR COUPLING.—Mr. Charles E. Macarthy, of Forsyth, Ga., has patented an improved car coupling, designed to couple the cars easily and securely by a lever under the car, and projecting at the side of the same, whereby all danger involved in going between the cars is avoided.

GARD AND COBLEY'S BLACK.

THIS invention relates to improvements in the manufacture of a black which is designated tannic black, and the employment of the same for making blacking, printing ink, and for other purposes. By this method the inventors are enabled to manufacture tannic black in an improved manner.

In order to carry out our invention, they proceed substantially as follows:—To each one hundred parts, more or less, of leather waste, shavings, cuttings, scraps, or waste of any kind, we add a suitable quantity of salts of iron, preferably a chloride or sesquichloride, or both of iron, according to the quantity of tannic acid contained in the leather waste to be treated, and to this leather waste we generally employ a solution of chloride or sesquichloride, or both of iron, such as the waste pickle from galvanising works or other industries, or directly prepared from any source of iron, as scrap, slag, or iron ore acted upon by hydrochloric acid or salt, such solution being brought to a strength of 70°, more or less, Tw., and of this solution sixteen parts more or less to the one hundred parts of leather waste we find work sufficiently well. The leather waste and iron liquor are placed in a suitable vessel, which may be open or partially closed, and sufficient water is added to cover the leather waste. Steam is now employed, in any convenient manner, to bring the mass to the boiling point, or the same may be boiled by direct firing. The ingredients are steamed or boiled for five or six hours more or less, until the contents of the boiler or vessel are converted into one black mass, which forms tannic black, a black substantially formed of the gelatine and fibrine of the leather or other substances impregnated with the tannate of iron, the former ingredients constituting the body and the latter the colouring matter thereof, such tannate of iron being produced by the action of the chloride or sesquichloride of iron upon the tannic present in the leather waste. The liquor is now drawn off and the resulting mass well washed with hot water or steam, to withdraw any undecomposed chloride or sesquichloride of iron or free acid produced, these liquors being likewise afterwards drawn off. The liquors containing acid are neutralised and used to form fresh chlorides of iron by adding powdered iron-stone or iron filings, scrap iron, or waste iron of any kind, and can then be employed for treating a further quantity of leather. Fresh chlorides or sesquichlorides of iron must be added to these liquors, to regulate and bring them up to the proper strength or equivalent proportion above described. After being well washed the mass or tannic black can be dried, and in this form is employed instead of lamp black, bone black, and various other substances for the manufacture of blacking, printing ink, paint, harness paste, and other articles for which it may be found suitable, being first ground to such degrees of fineness as may be desirable for the various purposes. For making blacking, they may use the following mixture, although they do not confine themselves to the proportions or ingredients, which may be varied with any known substitutes or additions, *i.e.*, 56 parts tannic black calculated in dry condition, 1 oil, 1-16 oil of tar, or carbolates, or analogous substances of an antiseptic nature, 27 parts (more or less) molasses and water in due proportion. These ingredients are well mixed, and the mass ground in a suitable mill. If the tannic black is used in a dry state the water is added. If in a moist or freshly-made condition, then the amount of water is determined and less added.

AN IMPROVED WASHING MACHINE patented by Mr. Alexander Fleming, of Orleans, Iowa, washes clothes by pumping or forcing water through them.

Proceedings of Societies.

ASIATIC SOCIETY.

JULY.—Sir E. Colebrooke, Bart., President, in the chair.—Mr. W. T. Roper was elected a Resident, and General Palma di Cesnola a Non-Resident, Member.—A large number of presents to the Society's library were announced, the most important being Dr. W. W. Hunter's "Gazetteer of India," vols. i.-vi.—A paper was read by Mr. M. V. Portman (who had lived for a long time in the jungle with the natives—is, indeed, the only European who has done so) "On the Andaman Islands and the Andamanese, in which he gave an able account of the geographical position of the islands, and of the strange savage people inhabiting them, with valuable details as to their social position, referring at the same time to what we already know from the visits of earlier officers or civilians who have been employed there. Mr. Portman illustrated his paper by the exhibition of a large number of objects he had collected there, including bows, arrows, personal ornaments, &c.

STATISTICAL SOCIETY.

JUNE 28.—Anniversary Meeting.—Dr. W. A. Guy in the chair.—The Report of the Council was read.—The following were elected to be the Council and Officers for the sessional year 1881-2:—President, J. Caird; Council, A. H. Bailey, Dr. T. G. Balfour, A. E. Bateman, G. Phillips Bevan, S. Bourne, Sir G. Campbell, J. O. Chadwick, H. Chubb, Hyde Clarke, Right Hon. the Earl of Dunraven, R. Giffen, R. Hamilton, F. Hendriks, N. A. Humphreys, R. Lawson, Prof. Leone Levi, Sir J. Lubbock, J. B. Martin, R. B. Martin, Dr. F. J. Mouat, F. G. P. Nelson, E. C. Nepean, G. Palmer, R. H. Patterson, H. D. Pochin, F. Purdy, Sir W. R. Robinson, T. A. Welton, C. Walford, and R. P. Williams; Treasurer, R. B. Martin; Secretaries, H. Chubb, R. Giffen, and J. B. Martin; Foreign Secretary, Dr. F. J. Mouat.

ENTOMOLOGICAL SOCIETY.

JULY 6.—H. T. Stainton, Esq., President, in the chair.—One new Member and one Subscriber were elected.—Mr. W. L. Distant exhibited the sexes of *Morpho Adonis*.—Miss E. A. Ormerod exhibited some elm leaves bleached by the attacks of a coleopterous larva; and larvae of a species of *Dolerus*, and of *Choræus graminis*, feeding on grass.—The Rev. E. A. Eaton exhibited drawings by Mr. A. T. Halleck of the nymphs of various ephemeridæ.—The secretary read the report of the committee appointed at the last meeting to inquire into the history of an insect found feeding on the eggs of locusts in the Troad. It proved to be a dipterous insect, apparently belonging to the Bombyliidæ; and specimens were exhibited by Sir S. S. Saunders.—The following papers were read:—"Descriptions of new Asiatic Diurnal Lepidoptera," by Mr. T. Moore;—"On the Species of the Genus *Euphroma*," by Mr. D. Sharp;—"Observations on the Species of the Homopterous Genus *Orthezia*," by Mr. J. W. Douglas;—"On the Lepidoptera of the Amazonas collected by Dr. Trail during the years 1873-1875, Part VI. Geometrites," by Mr. A. G. Butler;—"Note on the Larva of *Nycteribia*," by Baron Osten-Sacken;—"Notes on New or Interesting Species of Papilionidæ and Pieridæ collected by Mr. Buckley in Ecuador," by Mr. W. F. Kirby.

ANTHROPOLOGICAL INSTITUTE.

JUNE 28.—Major-General Pitt-Rivers, President, in the chair.—The election of Mr. R. Meldola was announced.—The President made some remarks on the great loss the Institute had sustained since the last meeting by the death of Professor Rolleston. Anthropology was his chief study during

the latter years of his life, and his communications to this Society were frequent and always valuable. To him we are indebted for the only scientific description that exists of crania of the stone age in this country, those of Cissbury and the long barrows.—Sir H. Bartle Frere read a paper "On the Laws affecting the Relations between Civilised and Savage Life, as bearing upon the Dealings of Colonists with Aborigines." The conclusions arrived at were: 1. That it is possible for the civilised to destroy by war the savage races, to expel, or repel, or turn them aside in their migrations. 2. That proximity of civilised to savage races has led, or is leading to the decay and probable extinction of the Bushman race; but this result is doubtful in the case of the Hottentot races, and is certainly not taking place with regard to the Basuto or Kaffir races. 3. That the changes consequent on proximity of civilised and uncivilised races are approximation to the European type of civilisation. 4. That the essentials to such approximation are: (a) a Pax Roumana or Anglicana, bringing with it (b) protection of life and property, which involves equality before the law, individual property in land, abolition of slavery, abolition of private rights of making war and of carrying arms without the authority of the supreme ruler; (c) power of local legislation on European principles, with a view to secure education in the arts of civilised life; taxation sufficient for state purposes, &c.; restrictions on the use of intoxicating substances, as measures essential to the attainment of any one of the preceding objects.

ARISTOTELIAN SOCIETY.

JULY 4.—S. H. Hodgson, Esq., President, in the chair.—A paper "On the Philosophy of Comte," by Dr. J. H. Bridges, was, in the absence of the author, read by Mr. F. H. Harrison. The relation of positive philosophy to positivism was first pointed out. Positivism was an attempt to systematise human life upon the basis of such knowledge as is available to man. The philosophy of Comte presents that basis. The agnostic position of positive philosophy in respect to theology and ontology was explained. In regard to phenomenism, positive philosophy did not deny that knowledge might be gained by introspection, but it held that far more resulted from observation of the collective achievements of the intellect of humanity throughout history. In conclusion, Dr. Bridges pointed out the chief fundamental distinctions between the Comtean synthesis and the synthetic philosophy of Mr. Herbert Spencer.—A lengthy discussion followed.

A SURGICAL MACHINE.

THE mechanical amputator of Dr. W. G. A. Bonhill, of Philadelphia, which has been recently presented by him to St. Bartholomew's Hospital, London, is one of the most novel and interesting triumphs of constructive skill. The apparatus consists of an iron standard carrying a train of multiplying gear, which by means of an endless cord passing over pulleys transmits a rapid rotary motion to either small drills or circular saws, as the case may require. These drills and saws are attached to the end of a series of rods connected by universal joints forming elbows, which permit the operator to move the cutting instrument in any direction he pleases while it is revolving at high speed. These instruments are only intended to deal with bone, and when it is desired to hold the fractured parts of a bone rigidly together in a certain position, holes are drilled into it, and pins inserted, which being held in a steel frame keep the parts in the position desired. The circular saws are employed to cut away portions of the bone, or sever the entire shaft. For simple amputations a small straight saw can be fitted into

a holder, and as the latter is attached to a small eccentric work from the main gearing it has a very rapid reciprocating action imparted to it by means of a small handwheel. By this means the comparatively slow oscillation of the surgeon's hand is superseded by the extremely rapid motion of the mechanical saw; and thus the time of an operation is greatly shortened, while the operation itself is much more neatly performed owing to the small size of the saw and its high velocity. The new engine has been freely dedicated by its inventor to the service of his profession, and has already come into extensive practice in the United States.

COMMISSIONERS OF PATENTS' REPORT.

THE Commissioners of Patents have issued their report of proceedings for the year 1880. The number of applications for Letters Patent during the year 1880 was 5,517, being 179 more than the preceding year. The results of the proceedings relating thereto are given in the following table:—

Applications for Letters Patent	5,517
Letters Patent sealed thereon	3,740
Letters Patent void, the Patentees having neglected to file final specifications in pursuance thereof	67
Letters Patent consequently remaining in force	3,673
Of which,	
Final specifications were filed in respect of	3,460
Complete specifications were filed in respect of	213
	3,673
Lapsed applications:	
Applicants having failed to seal their Patents	1,771
Patentees having neglected to file final specifications	67
Applications under opposition to grant or sealing of Letters Patent	6
	1,844

Patents remaining in force..... 3,673

The report further shows that about 65 per cent. of the Applications for Patents from 1852 to 1880 became valid Patents; that of the valid Patents obtained upon the Applications from 1852 to 1873 nearly 30 per cent. paid the third year's stamp duty of £50, and continued in force to the end of the seventh year; and that nearly 11 per cent. paid the seventh year's stamp duty of £100, and consequently remained in force for the full term of 14 years.

The provisional, complete, and final specifications (or descriptions of inventions) deposited and filed in the office from October 1, 1852 (when the Patent Law Amendment Act came into operation), in relation to 107,628 applications for patents, have been printed and published with outline copies of the drawings accompanying the same, according to the provisions of the Act 16 and 17 Vict., c. 115.

The Specifications of Patents under the old law (from the earliest period at which Specifications were enrolled down to the year 1852), 13,561 in number, have been printed and published in like manner.

The old and new law Specifications amount together to 121,189.

The Alphabetical and Subject-matter Indexes of Patents and Applications for Patents consist of two series, viz., the Old Law and the New Law. Under the old law one index (of each kind) embraces the whole period from A.D. 1617 to October, 1852. Under the new law, from October, 1852, to the present date, the indexes are published

separately for each year. In the Alphabetical Indexes the names of the patentees or inventors are arranged in strictly alphabetical order, followed by the date and the subject of the invention. In the Subject-matter Indexes the subjects or heads only are arranged alphabetically, the inventions under each head following in the order of date.

The Commissioners of Patents, becoming aware of the necessity of revising and consolidating the existing Indexes of Patents, appointed in August, 1878, a new staff of eight indexing clerks, to undertake the preparation of a new Subject-matter Index to the Specification of Patents under the old and new law. This staff had up to the end of 1880 made considerable progress with the work in hand; but the Commissioners, being desirous of accelerating the completion of the Index, have recently with the consent of the Treasury, augmented the staff by six additional clerks.

Abridgments of the Specifications of patented inventions are prepared and published in classes, each confined to one subject or group of subjects, in order to facilitate the searches of inventors who are desirous of ascertaining if their inventions are novel. Every volume is furnished with an elaborate subject-matter or analytical index (as well as an alphabetical index of the names of patentees and inventors) to guide the reader to the abstracts of the inventions belonging to any particular section of the class. On reading these, he will be able to determine which specifications he ought to consult for more minute information. The abridgments are arranged in the volume in chronological order, and at the foot of each is stated the price at which the printed copy of the specification can be purchased at the Commissioners of Patents' Sale Department (38, Cursitor Street, Chancery Lane, London, E.C.)

This series of works (which will consist of about 110 subjects), when completed to the end of the year 1876, will afford in a compact form a key to the inventions patented under each subject between the years 1617 and 1876. Thenceforth the volumes of abridgments will be published for decennial periods.

PRITCHETT'S HEATING APPARATUS.

THIS invention consists mainly of modifications and improvements in heating, lighting, and ventilating, and manufacture of apparatus applicable thereto, which modifications are more or less improvements upon Letters Patent granted to him, No. 1,613, A.D. 1880, and also applies to lighting and also heating either by oil, gas, or other sources of light and heat. In pursuance of the above he arranges by double plates formed of suitable shapes adjusted to, placed over, or in connection with gas, oil, coal, or other combustible materials. This invention refers more particularly, although not solely, to appliances for heating, ventilating, medical and sanitary purposes, also for lighting, as distinguished from the apparatus of double plates and tubes being supplied with heat from a distant or near, as described in the said patent. But his present improvements are more or less applicable for the use with the appliances described in said patent, as for example, the double plates, tube, &c., may be actuated and heated singly instead of in numbers, as therein described, and may be made portable if need be. Also their contents may flow and return from their lower edges or parts, not necessarily using their sides and tops for that purpose.

By this invention a better equalisation of temperature is obtained, also economy in the tubing and piping usually requisite for flow and return arrangements.

The plates and tubes may be in multiple form and have multiple flanges, gills, and

projections containing fluids or steam for increasing the heating surfaces of such appliances. To carry off the products of combustion flues may be supplied and utilised, and by regulating the inlet of air to them and sources of heat a more perfect and economical combustion of fuel and improved ventilation can be effected. The plates and tubes may be advantageously manufactured by preparing, bending, or capping them previous to their being corrugated, crimped, or shaped as distinguished from their being joined at their sections or edges out of materials corrugated, shaped, or crimped previous to their manufacture; thus numerous joints can be avoided and a better security against leakage effected. When the improvements are applied for cooling, the cooling mixture is passed through the apparatus, cooling the air in its passage and promoting ventilation.

RECENT AMERICAN AND FOREIGN INVENTIONS.

Magic Pen and Pencil.—In most of the so-called "magic" pen- and pencil-cases the pen cannot be pushed out for use unless the pencil is also out; hence, in using the pen, the pencil is apt to become inked, and its point or lead thereby injured. Mr. Richard M. Collard, of New York city, has patented a pen- and pencil-case in which this defect is remedied, by so constructing the case that the pencil can be attached to or detached from the "magic movement" at the will of the user, so that the pencil-point will not be out while using the pen, though the case can be drawn to its full length.

An improved Ice-Cream Freezer has been patented by Mr. John Marsden, of Chester, Pa. The object of this invention is to furnish ice-cream freezers so constructed that they will make smoother cream than the ordinary freezers, and will make a greater quantity of cream from the same quantity of material.

A Velocipede, designed to be operated by two persons standing and applying their whole weight to the treadles, has been patented by Mr. Oliver U. Guinand, of Lawrenceburg, Ky. This vehicle is more easy to mount than the velocipedes in common use, and affords conveniences for carrying small parcels and packages.

An improved Motive Power has been patented by Mr. Obadiah W. Gibson, of Kellyville, Texas. The invention relates to improvements in motive powers by which the entire power of the horse is thrown on the shaft that operates the gear mechanism, which may be applied to the running of cotton gins, grist and flouring mills, and other purposes. The invention consists of an inclined wheel applied to a centre shaft that turns in fixed bottom bearings and adjustable top bearings, and transmits the power by a crown wheel and gear wheels and shafts in one or both directions.

Cloth Measuring and Cutting.—Messrs. Charles C. Henderson and Jacob B. Henderson, of Arkadelphia, Ark., have patented a machine adapted for measuring heavy cloths, bagging, and similar materials in lengths, as desired, in place of the usual method of measuring by hand. More particularly the object is to wind the material from the roll upon a suitable drum, measure the material as it is wound, and provide an indicator of the amount rolled off, so that the desired quantity can be wound and then cut off.

Peeling Vegetables or Fruits, such as potatoes and apples, is the subject of a patent by Mr. Hervey Law, of Chatham, N.J. This machine is especially designed for peeling potatoes, which are usually of very irregular forms and sizes; and the invention consists in means whereby the cutter may be quickly set to a longer or shorter travel to correspond to the length of the potato.

A Cloth-measuring Machine has been pa-

tented by Messrs. Charles C. Henderson and Jacob B. Henderson, of Arkadelphia, Ark. This improvement relates to machines for winding off and measuring bagging and heavy bolt goods, and is designed to save the time and labour required in doing such work by hand. It is specially calculated to relieve the counting shaft of weight from the passing web.

Removing Fire-damp from Mines; patentee Mr. Francis Wodiczka, of Gratz, Austria. The invention consists in arranging a pipe or channel, provided with a series of suction funnels, along the ridge of all the galleries and adits of a mine, which channel is connected with a side channel, which, in turn, leads into the main or receiving channel, which is in communication with the gas flue or chimney.

An improved Air-compressor and Faucet has been patented by Mr. Samuel A. Livingston, of East New York, N.Y. The object of the invention is to aerate beer, as well as create a pressure by forcing air up through the liquid, and also to allow a keg to be tapped without permitting the natural gases of the liquid to escape.

An improvement in Wash-basins has been patented by Mr. Chas. E. Robinson, of New York city, N.Y. The invention relates more particularly to that class of basins known as the "Wellington," which consist of two concentric basins, the inner one of which overflows over its top edge into the outer one, both of which discharge through a central opening at the bottom into a circular trap suspended in a circular trap-chamber, which is detachably held to the bottom of the outer basin and coupled to the waste-pipe.

An improved Bridge has been patented by Mr. August W. Brenner, of Coleman, Texas. The object of this invention is to construct substantial bridges of wood adapted for long spans, and which can be put up where iron bridges would be too expensive. The invention consists in a bridge composed of arches having a central trussed portion, and ends formed as trusses that support the central portion and sustain the end thrust.

An improvement in Ore-Washers has been patented by Mr. Burrall A. Peirce, of Mouth of Wilson, Va. The invention consists in combining guides and swinging shovels on the ends of blades, the latter arranged on the rotary shaft of an ore-washer.

Chair.—Messrs. Edward W. Chambers and Thomas P. Burnett, of Springfield, Ohio, have patented an improved chair for theatres, churches, halls, &c., which can be folded very easily and compactly. The invention consists in a chair in which the back is pivoted to the rear end of the seat, which is pivoted to two standards and to the arm rests, which are pivoted to the tops of the standards, so that the back will move toward the standards and the arm rests will be inclined downward, thus occupying very little space when the seat is raised.

Guano and seed drills.—Mr. James Rankin, of Fairlee, Md., has patented an improvement in guano distributors arranged on the frame of a seed drill; and it consists of a guano hopper provided with a series of openings or slots in its bottom, in each of which slots projects a part of the circumference of a revolving wheel provided with a central groove, which receives and carries the guano to the seed spout, a roll provided with arms and staples and passing longitudinally through the hopper being employed to force the guano into the grooved wheels.

An improved trip hammer has been patented by Mr. Solomon Shetter, of New Cumberland, W. Va. This invention relates to a means for regulating the force of the blow given by the hammer, and for entirely stopping the motion of the hammer with ease and celerity without stopping the engine or other motive power by which the hammer is driven, and without the necessity

for shifting a belt from a fast to a loose pulley.

An improved stop-cock has been patented by Mr. John Flanagan, of Newburg, N. Y. The invention consists in constructing a stop-cock with an inclined or slightly curved branch pipe, so that a steam tube can be readily inserted through or a force pump connected with the stop-cock for thawing out or removing obstructions from pipes.

Firearms.—Mr. W. T. Hall, of Fayetteville, Ind., has patented a charge holder for firearms, a device for use in loading shot-guns and rifles, which can be more conveniently used than an ordinary powder flask and shot pouch, and by which the arm can be rapidly loaded. The invention consists in a shell or tube of a suitable size for holding a single charge and wad, and fitted with a finger slide for pressing out the wad, so that the charge can be poured into the gun.

A car coupling has been patented by Mr. John H. B. McCray, of Blossom Prairie, Texas. This invention relates to self-couplers, and it consists of an open-top hook-shaped draw bar provided with a pivoted T-shaped vertically moving coupling bar, and provided also with an end socket for using the ordinary coupling link.

An improved self-acting pumping-engine has been patented by Mr. Edward G. Shortt, of Carthage, N. Y. The invention relates to certain improvements in that class of direct-acting steam pumps in which a single plunger is constructed at its upper-end in the form of a piston to be acted upon by steam, while its lower end acts within a pump cylinder in connection with suitable ports and check valves, and in which the steam cylinder is in one and the same piece with the pump cylinder and in the vertical line of the same, with a valve chest and gear mounted upon the top of the same and operated through a connection with the piston.

An improved locomotive engine has been patented by Mr. Ephraim Shay, of Haring, Mich. The invention consists of a locomotive having its bogie wheels-formed with bevel gear teeth combined with a horizontal and longitudinally arranged shaft, also having bevel gear wheels, the shaft being rotated by a direct connection with the engine; also, in novel means for providing for the horizontal and vertical adjustment of the connecting shaft between the crank shaft and the bogie wheels, and in novel means of conveying the power of the engine to said bogie wheels.

An improved pocket knife has been patented by Mr. August Rischow, of Elizabeth, N. J. The object of this invention is to prevent the blades of pocket knives from being raised accidentally and from folding or collapsing while the knife is being used. The invention consists in a handle with longitudinal slots, in which bars fit, which are pivoted to the lower ends of the knife blades, which slide between suitable guides in the handle, and are provided with suitable packing.

An improvement in sash fasteners, patented by Mr. Stephen P. Rush, of Tyrone, Pa., consists in the peculiar arrangement of parts whereby the lower sash is locked when down and the upper sash locked when raised by the movement up and down of the sashes; or either sash may be locked in a partially raised or lowered position.

Welding pipe sections has been the subject of a patent by Mr. Henry V. Hartz, of Cleveland, O. This invention relates to a novel method of preparing and welding together sections of metal pipe or tubing. It is designed more particularly for welding short sections on to old boiler tubes, so as to give them sufficient length to permit them to be again reset in the same tube sheets, the old tubes being too short to be reset without lengthening. The ordinary method of resetting old tubes is to mill down or hammer

one end of a section of tube to an entering bevel or male end, and expand by hammering or milling the end of the other section to a tapering or female end adapted to receive the male end, after which they are joined and welded together by hand. The difficulty attending this plan is that much labour is required to prepare the ends, and the time required to turn and weld the sections on all sides is such that the heat decreases at the end of the operation, so as to fail to secure the most perfect uniting of the parts, and both skilled workmen and hand labour are required for the work. The invention referred to consists in simultaneously cutting off and scarfing or beveling the male or entering end by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time holding down the metal on each side of the channel to prevent enlargement of the cut ends; then in a second operation cutting and expanding the female end simultaneously by rolling a bevel channel around the tube on a mandrel, and continuing this rolling action until the section is severed, and at the same time allowing the metal on each side of the bevel cut to spread or move freely, to permit the cut ends to be expanded, by the mashing action of the roll, to a diameter large enough to receive the male end.

Anchor, as usually made, have two rigid flukes projecting in opposite directions from one end of the shank, an eye or ring at the other end, for connection of the chain, and a stock passing through the shank at the end where the chain is connected. Such anchors hold by either fluke, and, as will be readily understood, the fluke end will be lowest in the bottom while holding, the other end of the shank remaining above or being in the bottom but a short distance. Mr. John J. Moule, of Fishkill-on-the-Hudson, N. Y., has patented an improvement, the object of which is, first, to cause the anchor to sink throughout the whole length of the shank and to give a hold on the bottom at both ends of the shank; second, to prevent the chain from fouling on the stock.

An improved swimming apparatus has been patented by Mr. William Beeson, of Dillon, Montana Ter. This invention relates to a novel construction of swimming apparatus, and it is in the nature of a detachable suit provided with pockets or receptacles for the body and limbs, and having between the pockets for the limbs a web portion, which acts like wings or fins, which, from the movement of the legs and arms, effect a propulsion through the water.

An improved pillow or bolster has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the stuffing of pillows and bolsters from being crowded out of place by pressure applied to parts of the pillows or bolsters. The invention consists of a pillow or bolster made with an inner cover filled with stuffing, and an outer cover having a layer of stuffing interposed between it and the said inner cover, whereby the stuffing will be kept in place when under pressure.

An improved switch for butchers' tracks has been patented by Mr. Charles Cole, of West Newton, Mass. This invention relates to an overhead track on which runs trucks provided with hangers, upon which heavy articles can be suspended beneath the track and readily moved from place to place; and its objects are to provide a convenient way to connect the main track with the branches which extend to different parts of the room or inclosure, and to provide a convenient method of shifting such connecting main track from connection with one branch to connection with another.

An improvement in shipping cases has been patented by Mr. Charles R. Peaslee, of Louisville, Ky. This invention is an improvement in the class of shipping cases for

large oil cans, in which interior grooves are provided for reception of the gudgeons or pivots of the can for the purpose of protecting them while the can is being shipped.

Metal Coating.—Heretofore, alloys, in which lead forms a competent part have been used for coating cast and wrought iron to protect the same against oxidation, and zinc in tin alone are in common use for this purpose; but several objections and difficulties attended the use of these materials when applied by the methods now known—as, for instance, when zinc or tin is used and applied directly upon the iron the zinc attaches the iron in such a manner as to injure its durability and tenacity, and this is also true of such alloys as antimony, bismuth, and lead, and nickel, tin, zinc, and lead; and, besides, in applying these alloys or the zinc a dross is formed in the molten baths, which is troublesome to remove, and results in a loss of metal, and wrought or cast iron has never been successfully coated with unalloyed lead. Mr. William Frishmuth, of Philadelphia, Pa., has patented a process of thoroughly and effectively coating cast iron or sheets of wrought or cast iron or other metals with pure lead, or with zinc or tin, in such manner that the metal coated will be protected against oxidation and its durability and tenacity preserved, and in such manner that there will be no formation of dross in the molten baths. The invention consists essentially in protecting or preparing the surfaces to be coated by depositing upon them, by electroplating or otherwise, a thin coating of nickel, or an alloy of nickel and aluminium.

An improved elevated railway has been patented by Mr. John G. Curtis, of Ludlow, Pa. The invention is more particularly intended for use inside of a building, to convey goods from one part of the building to another, and it may also be used for conveying goods from one building to another, or from place to place in a tannery or other extensive establishments. It consists in a novel construction, arrangement, and combination of an elevated rail or track, a two-wheeled truck, and a car or platform suspended from the truck.

TUNNELLING MONT BLANC.—The French Government has for some time past been contemplating the construction of a great railway tunnel in order to bring Paris and the northern parts of France into more direct communication with Italy than is afforded by the existing tunnel through Mont Cenis. The projects proposed include a tunnel through Mont Blanc, and another through the Simplon, or the Great St. Bernard. The last of the three has found very few friends, but it appears likely that both the former projects will be carried out. The projected Simplon tunnel is 60,719 ft. in length, while that through Mont Blanc is 44,292 ft. Comparing these with the other Alpine tunnels, we find that the Mont Cenis is 40,093 ft., and the St. Gothard 48,952 ft. long. The Simplon would, therefore, be the longest of all; but this is compensated for by the fact that it is at a much lower level than the rest, the entrance at Brig being only 2333 ft., and that at Iselle, 2253 ft. above the sea level. The entrances to the Mont Blanc tunnel, on the other hand, would be 3345 ft. at Montquart, and 4215 ft. at Entreves, above the level of the sea. The Bardonnèche entrance to the Mont Cenis tunnel is 3970 ft., and that at Modane 3799 ft. above sea level; while in the case of the St. Gothard tunnel, the northern entrance at Göschenen is 3638 ft., and the southern at Airolo 3756 ft. above the level of the sea. Thus, the Mont Cenis tunnel is shorter, but 330 ft. higher than the Mont Blanc, while the Simplon would be almost half as long again, but would be about 10,000 ft. lower.